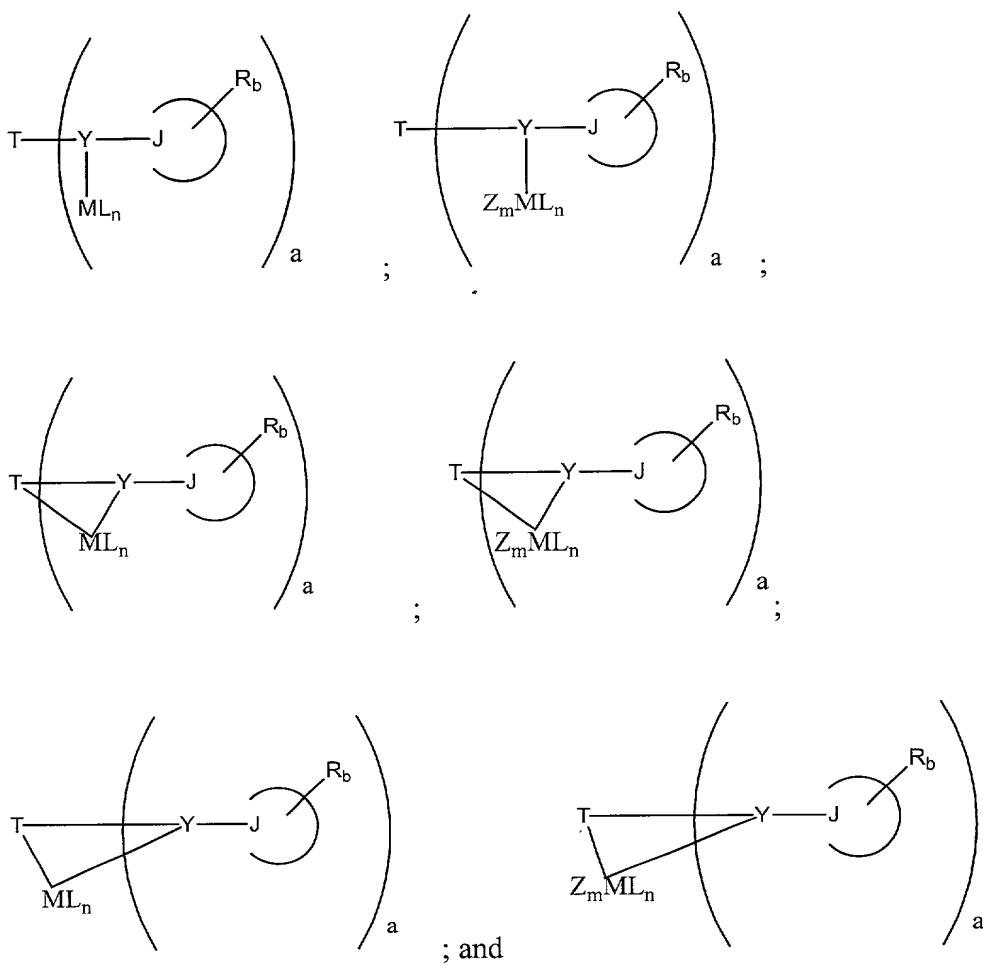


CLAIMS

1. A catalyst precursor represented by one of the formula selected from:



where a is an integer from 1 to 5;

T is a chemical moiety having 1 to 100 atoms, which can include hydrogen

when a is equal to 1 is a bridging group when a is equal to 2 to 5;

M is a metallic element selected from Groups 1 to 15, and the Lanthanide series of the Periodic Table of the Elements;

Z is a coordination ligand;

m is an integer from 1 to 3;

each L is a monovalent, bivalent, or trivalent anionic ligand;

n is an integer from 1 to 6;

m is an integer from 0 to 5;

Y is a heteroatom selected from nitrogen, oxygen, sulfur, and phosphorus;

J is a heteroatom that is part of a ring structure and is selected from nitrogen, oxygen, sulfur, and phosphorus;

R can be independently hydrogen, or a non-bulky or a bulky substituent; and

b is an integer from 0 to 20.

2. The catalyst precursor of claim 1 wherein Z is selected from at least one of triphenylphosphine, tris(C₁-C₆ alkyl) phosphine, tricycloalkyl phosphine, diphenyl alkyl phosphine, dialkyl phenyl phosphine, trialkylamine, arylamine, a substituted or unsubstituted C₂ to C₂₀ alkene, an ester group, a C₁ to C₄ alkoxy group, an amine group, carboxylic acid, and di(C₁ to C₃) alkyl ether, an η^4 -diene, tetrahydrofuran, and a nitrile.

3. The catalyst precursor of claim 1 wherein each L is an anionic ligand independently selected from those containing from about 1 to 50 non-hydrogen atoms and selected from the group comprised of halogen containing groups; hydrogen; alkyl; aryl; alkenyl; alkylaryl; arylalkyl; hydrocarboxy; amides, phosphides; sulfides; silyalkyls; diketones; borohydrides; and carboxylantes.

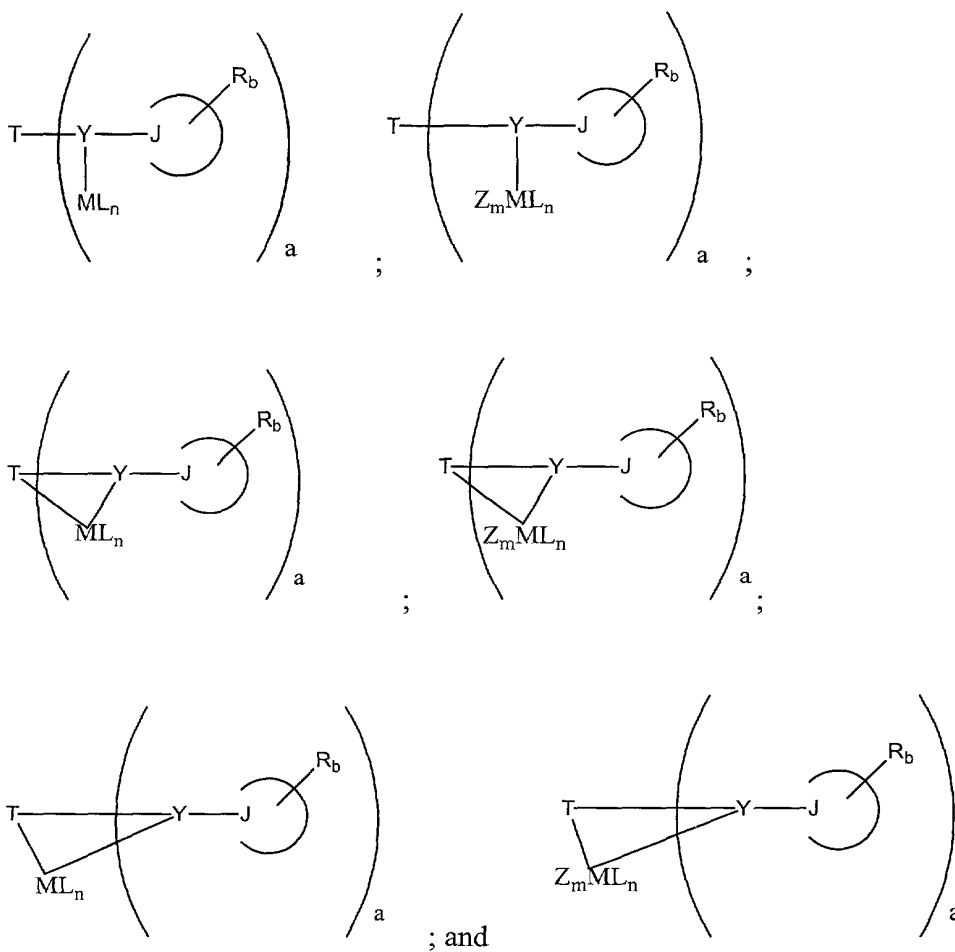
4. The catalyst precursor of claim 3 wherein each L is an anionic ligand independently selected from those containing from about 1 to 20 non-hydrogen atoms and selected from the alkyl, arylalkyl, and halogen containing groups.

5. The catalyst precursor of claim 1 wherein M is selected from groups 3 to 7 of the Periodic Table of the Elements.

6. The catalyst precursor of claim 5 wherein M is selected from Hf and Zr.
7. The catalyst precursor of claim 1 wherein n is an integer from 1 to 4.
8. The catalyst precursor of claim 1 wherein both Y and J are nitrogen.
9. The catalyst precursor of claim 1 wherein R is a non-bulky substituent selected from straight and branched chain alkyl groups.
10. The catalyst precursor of claim 9 wherein R is a C₁ to C₁₀ straight chain alkyl group.
11. The catalyst precursor of claim 1 wherein R is a bulky substituent containing from about 3 to 50 non-hydrogen atoms and be selected from alkyl, alkenyl, cycloalkyl, heterocyclic (both heteroalkyl and heteroaryl), alkylaryl, arylalkyl, polymeric, and inorganic ring moieties.
12. The catalyst precursor of claim 11 wherein R contains from about 4 to 20 non-hydrogen atoms.
13. The catalyst precursor of claim 1 wherein the ring to which J is part of is a five or six member ring.

14. A catalyst composition comprised of:

a) a catalyst precursor represented by one of the formulae selected from:



where a is an integer from 1 to 5;

T is a chemical moiety having 1 to 100 atoms, which can include hydrogen

when a is equal to 1 is a bridging group when a is equal to 2 to 5;

M is a metallic element selected from Groups 1 to 15, and the Lanthanide series of the Periodic Table of the Elements;

Z is a coordination ligand;

m is an integer from 1 to 3;

-53-

- each L is a monovalent, bivalent, or trivalent anionic ligand;
 n is an integer from 1 to 6;
 m is an integer from 0 to 5;
 Y is a heteroatom selected from nitrogen, oxygen, sulfur, and phosphorus;
 J is a heteroatom that is part of a ring structure and is selected from nitrogen, oxygen, sulfur, and phosphorus;
 R can be independently hydrogen, or a non-bulky or a bulky substituent; and
 b is an integer from 0 to 20; and
 b) an activating cocatalyst.
15. The catalyst composition of claim 14 wherein Z is selected from at least one of triphenylphosphine, tris(C₁-C₆ alkyl) phosphine, tricycloalkyl phosphine, diphenyl alkyl phosphine, dialkyl phenyl phosphine, trialkylamine, arylamine, a substituted or unsubstituted C₂ to C₂₀ alkene, an ester group, a C₁ to C₄ alkoxy group, an amine group, carboxylic acid, and di(C₁ to C₃) alkyl ether, an η^4 -diene, tetrahydrofuran, and a nitrile.
16. The catalyst composition of claim 14 wherein each L is an anionic ligand independently selected from those containing from about 1 to 50 non-hydrogen atoms and selected from the group comprised of halogen containing groups; hydrogen; alkyl; aryl; alkenyl; alkylaryl; arylalkyl; hydrocarboxy; amides, phosphides; sulfides; silyalkyls; diketones; borohydrides; and carboxylantes.
17. The catalyst composition of claim 16 wherein each L is an anionic ligand independently selected from those containing from about 1 to 20 non-hydrogen atoms and selected from the alkyl, arylalkyl, and halogen containing groups.

18. The catalyst composition of claim 14 wherein M is selected from groups 3 to 7 of the Periodic Table of the Elements.
19. The catalyst composition of claim 18 wherein M is selected from Hf and Zr.
20. The catalyst composition of claim 14 wherein n is an integer from 1 to 4.
21. The catalyst composition of claim 14 wherein both Y and J are nitrogen.
22. The catalyst composition of claim 14 wherein R is a non-bulky substituent selected from straight and branched chain alkyl groups.
23. The catalyst composition of claim 22 wherein R is a C₁ to C₁₀ straight chain alkyl group.
24. The catalyst composition of claim 14 wherein R is a bulky substituent containing from about 3 to 50 non-hydrogen atoms and be selected from alkyl, alkenyl, cycloalkyl, heterocyclic (both heteroalkyl and heteroaryl), alkylaryl, arylalkyl, polymeric, and inorganic ring moieties.
25. The catalyst composition of claim 14 wherein R contains from about 4 to 20 non-hydrogen atoms.
26. The catalyst precursor of claim 14 wherein the ring to which J is part of is a five or six member ring.